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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/660,565	09/12/2003	Howard Rhodes	M4065.0570/P570-A	5308
45374	7590	10/09/2007		
DICKSTEIN SHAPIRO LLP 1825 EYE STREET, NW WASHINGTON, DC 20006			EXAMINER ARENA, ANDREW OWENS	
			ART UNIT 2811	PAPER NUMBER
			MAIL DATE 10/09/2007	DELIVERY MODE PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	Application No.	Applicant(s)	
	10/660,565	RHODES ET AL.	
	Examiner	Art Unit	
	Andrew O. Arena	2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 16 July 2007.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 90,93-125 and 128-141 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 90,93-121 and 130-136 is/are allowed.
- 6) ☒ Claim(s) 122-125, 128, 129 and 137-141 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

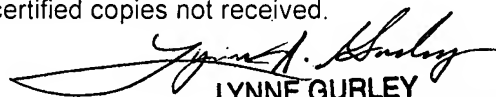
#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 16 July 2007 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

  
**LYNNE GURLEY**  
**SUPERVISORY PATENT EXAMINER**  
**AU 2811, TC 2800**

#### Attachment(s)

- |                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>1) <input type="checkbox"/> Notice of References Cited (PTO-892)</p> <p>2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)</p> <p>3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br/>Paper No(s)/Mail Date _____</p> | <p>4) <input type="checkbox"/> Interview Summary (PTO-413)<br/>Paper No(s)/Mail Date. _____</p> <p>5) <input type="checkbox"/> Notice of Informal Patent Application</p> <p>6) <input type="checkbox"/> Other: _____</p> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

Claims 122-125, 128, 129 and 137-141 are rejected under 35 U.S.C. 103(a) as being obvious in view of Rhodes (US 6,204,524) and Lauxtermann (US 2001/0015831).

**Re claim 122**, Rhodes discloses (Fig 6-14) a method of forming an imager (col 8 In 28-30) comprising the steps of:

providing a semiconductor substrate (116+120; col 8 In 30-32) having a doped layer (120) of a first conductivity type (col 8 In 32-33);

forming a field oxide region (115; col 7 In 25-28) in said semiconductor substrate;

forming a photosensor (Fig 5: 125, col 7 In 36-37; col 8 In 45 – col 9 In 25)

including a charge collection region (110) of a second conductivity type (col 7 In 31-32), said charge collection region being provided in said doped layer (col 7 In 30-31), said charge collection region being adjacent one side (left) of a gate of a pixel transistor (128; col 7 In 37-38);

forming a floating diffusion region (130; col 7 In 41-43, col 9 In 8-17) for receiving charge (accumulated: col 7 In 46-48) from said charge collection region (by way of transfer transistor 128: col 7 In 37-38), said floating diffusion region being connected to said gate of said pixel transistor (128) and being adjacent another side (right) of said gate (of 128) opposite said charge collection region (110); and

forming a charge storage capacitor (162; col 9 In 36-37) over said semiconductor substrate (col 7 In 66-67) so that one electrode (156) of said storage capacitor is connected directly to a region (155) by an electrical contact (150; col 8 In 10-13).

Rhodes differs from the claimed invention only in not disclosing one charge storage capacitor electrode connected directly to said floating diffusion region by an electrical contact and the other electrode of said storage capacitor connected to a gate of another transistor.

Lauxtermann discloses (Fig 2B) an analogous CMOS imager (§1) comprising: a photosensor (PD; ¶6 In 5) and a floating (no fixed potential) diffusion region (55; ¶7 In 6) for receiving charge from said photosensor (¶6 In 7-11) adjacent opposite sides of a gate of a pixel transistor (M2; ¶8 In 3); and one electrode (top in drawing) of a charge storage capacitor (C1; ¶6 In 10-11) is connected directly to said floating diffusion region (55) by an electrical contact and the other electrode (bottom in drawing) is connected (any connection type as per MPEP § 2111) to a gate of another transistor (M4; a capacitive connection is established) to allow separation of the detection and reading processes (¶6 In 17-19).

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify Rhodes in view of Lauxtermann by forming a charge storage capacitor over said semiconductor substrate using the method taught by Rhodes so that one electrode of said storage capacitor is connected directly to said floating diffusion region by an electrical contact; at least to allow separation of the detection and reading processes.

**Re claim 123**, Rhodes as modified discloses the entire extent of said charge storage capacitor overlies said field oxide region (no portion of lies under 115).

**Re claim 124**, Rhodes as modified discloses the entire extent of said charge storage capacitor overlies an active area of said photosensor (no portion lies under 125).

**Re claim 125**, Rhodes as modified discloses said charge storage capacitor is formed (at least) partially over said field oxide region (no portion lies under 115) and (at least) partially over an active area of said photosensor (no portion lies under 125).

**Re claim 128**, Rhodes discloses (Fig 14) said transistor (ex, 128) is part of a three-transistor cell (e.g., 102, 128, 132).

**Re claim 129**, Rhodes discloses (Fig 5) said transistor (ex, 128) is part of a four-transistor cell (e.g., 102, 128, 132, 136).

**Re claim 137**, Rhodes discloses (Fig 6-14) a method of forming an imager (col 8 ln 28-30) comprising the steps of:

- providing a semiconductor substrate (116+120; col 8 ln 30-32) having a doped layer (120) of a first conductivity type (col 8 ln 32-33);

- forming a field oxide region (115; col 7 ln 25-28) in said semiconductor substrate;

- forming a photosensor (Fig 5: 125, col 7 ln 36-37; col 8 ln 45 – col 9 ln 25) including a charge collection region (110) of a second conductivity type (col 7 ln 31-32), said charge collection region being provided in said doped layer (col 7 ln 30-31), said charge collection region being adjacent one side (left) of a gate of a pixel transistor (128; col 7 ln 37-38);

- forming a floating diffusion region (130; col 7 ln 41-43, col 9 ln 8-17) for receiving charge (accumulated: col 7 ln 46-48) from said charge collection region (by way of

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transfer transistor 128: col 7 ln 37-38), said floating diffusion region being connected to said gate of said pixel transistor (128) and being adjacent another side (right) of said gate (of 128) opposite said charge collection region (110); and

connecting an electrode (156) of a {second} charge storage capacitor (Fig 5: 162; col 9 ln 36-37) to said charge collection region (110) by a {second} electrical contact (150; col 7 ln 61-64).

Rhodes differs from the claimed invention only in not disclosing "connecting an electrode of a first charge storage capacitor to said floating diffusion region."

Lauxtermann discloses (Fig 2B) an analogous CMOS imager (§1) comprising: a photosensor (PD; ¶6 ln 5) and a floating (no fixed potential) diffusion region (55; ¶7 ln 6) for receiving charge from said photosensor (¶6 ln 7-11) adjacent opposite sides of a gate of a pixel transistor (M2; ¶8 ln 3); and one electrode of a charge storage capacitor (C1; ¶6 ln 10-11) is connected directly to said floating diffusion region by an electrical contact to allow separation of the detection and reading processes (¶6 ln 17-19).

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify Rhodes in view of Lauxtermann by forming a first charge storage capacitor over said semiconductor substrate using the method taught by Rhodes and then connecting an electrode of said first charge storage capacitor to said floating diffusion region by a first electrical contact; at least to allow separation of the detection and reading processes.

**Re claim 138**, Rhodes as modified discloses said first charge storage capacitor is formed such that the extent of said charge storage capacitor overlies said field oxide region (no portion lies under 115).

**Re claim 139**, Rhodes as modified discloses a first portion of said first charge storage capacitor is formed over said field oxide region (no portion lies under 115), and a second portion of said first charge storage capacitor is formed over an active area of said photosensor (no portion lies under 125).

**Re claim 140**, Rhodes as modified discloses said second charge storage capacitor is formed such that the extent of said charge storage capacitor overlies said field oxide region (no portion lies under 115).

**Re claim 141**, Rhodes as modified discloses a first portion of said second charge storage capacitor is formed over said field oxide region (no portion lies under 115), and a second portion of said second charge storage capacitor is formed over an active area of said photosensor (no portion lies under 125).

### ***Response to Arguments***

The arguments filed 07/16/2007 have been fully considered but they are not persuasive.

The arguments that the combined prior art does not teach a capacitor having one electrode connected directly to the floating diffusion region and another connected to a gate of another transistor (pg 16 ¶2 – pg 17 ¶1) are not persuasive since the claim language “connected” allows for indirect connections. See MPEP § 2111.

The arguments that "Rhodes teaches only one capacitor" and "Lauxtermann also teaches only one capacitor" (pg 17) are against the references individually and cannot be the basis of showing nonobviousness since the rejections are based on combinations of references. See MPEP § 2145(IV).

Rhodes teaches one capacitor connected to the charge collection region for the advantage of improving collection capacity (col 5 ln 47-59). Lauxtermann teaches a nearly-identical device having one capacitor connected to the floating diffusion region for the advantage of separating the detection and reading processes (§6 ln 17-19). The references as a whole suggest the desirability of the claimed invention including two capacitors for two purposes, the sheer similarity of devices provides a reasonable expectation of success. See MPEP § 2141(II).

#### ***Allowable Subject Matter***

Claims 90, 93-121 and 130-136 are allowed.

Reasons for allowance are of record (office action dated 04/30/2007).

#### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).




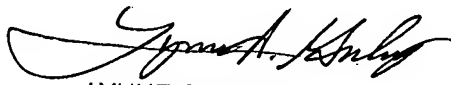
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andrew O. Arena whose telephone number is 571-272-5976. The examiner can normally be reached on M-F 8:30-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lynne A. Gurley can be reached on 571- 272-1670. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

  
Andrew O. Arena  
1 October 2007

  
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